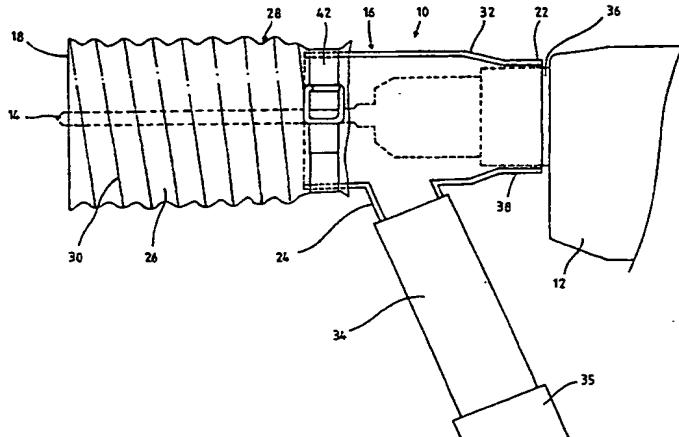




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(54) Title: DEBRIS EXTRACTION FITTING



(57) Abstract

A debris extracting fitting (10) is described for use with a hand-held power tool such as a rotary drill (12). The fitting (10) comprises a shroud (16) taking the form of an elongate tubular member (28) which surrounds a drill bit (14). The tubular member (28) has first end (18) for abutting a brick wall (20) on which the drill bit (14) is to be applied and an opposite end (22) for connection to the drill (12). The fitting (10) includes a conduit (24) in fluid communication with the elongate member (28) which is adapted for connection to a vacuum source. The elongate tubular member includes a compressible portion (26) which is able to compress in length a distance equal to the depth of the hole required to be made by the drill (12). The member (28) also includes a substantially rigid portion (32) which is attached by clamp (42) to an end of the compressible portion (26) opposite end (18). The substantially rigid portion (22) includes a collar (38) of reduced diameter for receiving a boss (36) of the drill (12). When in use, end (18) of the member (28) is pressed against wall and compresses as the drill bit (14) cuts into the wall (20). Debris created by the drill bit is contained within the elongate member (28) and passes by way of a vacuum through conduit (24) to the vacuum source.

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DEBRIS EXTRACTION FITTING

FIELD OF THE INVENTION

The present invention relates to a debris extraction fitting for use with a hand-held power tool.

5 BACKGROUND OF THE INVENTION

Generally, an unavoidable consequence of using a hand-held power tool is the generation of debris as the power tool acts on a surface or work piece. The debris may be in the form of shavings or small particles emanating from the surface or work piece and can include fine particles such as dust. For example, in the case of a hand-held masonry drill the debris is in the form of dust together with small particles of brick, plaster or mortar. During use of the power tool, the debris either falls directly to the ground by the action of gravity or initially becomes airborne and settles at a location distant from the place of use of the hand tool.

Some hand tools such as power planes and circular saws are occasionally fitted with collection bags for collecting debris generated. The debris is typically thrown into the bag by the motion of the cutting means itself. While this arrangement is useful in picking up larger particles of debris it is often unsatisfactory for collecting finer particles of debris such as dust generated by the power tool.

The generation of debris itself can be irritating or indeed even dangerous from a health point of view depending on the nature of the material acted upon by the hand-held power tool. Further, in some work environments, dust can damage or cause faults in sensitive equipment such as computers and electronic sensors. In addition, eventually the debris generated must be cleaned which is generally inconvenient and can be particularly annoying when the area in which the hand-held power tool was used

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was recently cleaned. In addition, from the view point of a tradesman using a hand-held power tool, in order to increase customer satisfaction, it would be preferable to clean the debris after use. However, this will increase
5 the time required by the tradesman to provide a service and therefore lead to an increase in costs to the consumer. Alternatively, the tradesman could choose not to clean the work area which may lead to customer dissatisfaction and loss of return work.

10 SUMMARY OF THE INVENTION

It is an object of the present invention to provide a debris extraction fitting adapted for connection to a hand-held power tool to collect debris as it is generated by the power tool.

15 According to the present invention there is provided a debris extraction fitting adapted for connection to a hand-held power tool having a cutting means, said fitting comprising:

20 a shroud for abutting a work surface on which said cutting means is applied, said shroud surrounding at least a portion of said cutting means adjacent said surface; and,

25 a conduit in fluid communication with said shroud, said conduit having a distant end adapted for connection to a vacuum source, whereby, in use, when a vacuum source is connected to said conduit and said cutting means applied against said surface, debris created by said cutting means is carried from said surface through said shroud and said conduit to said vacuum source.

30 Preferably said shroud includes a compressible portion which can compress in the direction of cutting by said cutting means, whereby, in use, said compressible portion can compress by a distance equal to the length of the cut required to be made by said cutting means.

35 Preferably said shroud comprises an elongate tubular member and said compressible portion is formed

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along a length of said elongate tubular member, said elongate tubular member surrounding at least a portion of said cutting means adjacent said surface and having a first end adapted for abutting said surface.

5 Preferably a second end of said elongate tubular member is adapted for connection to said hand-held power tool.

10 Preferably said elongate tubular member includes a substantially rigid portion, being substantially rigid in the direction of the length of said elongate tubular member, and wherein, said conduit is connected to said substantially rigid portion.

15 Preferably said substantially rigid portion is disposed adjacent one of said first and second ends of said elongate tubular member.

20 Preferably said substantially rigid portion is disposed at said second end of said elongate tubular member and said compressible portion is disposed at said first end of said elongate tubular member.

25 Preferably said compressible portion and said substantially rigid portion are detachably coupled together.

30 Preferably said compressible portion is resiliently compressible so as to return to a non-compressed state upon removal of said elongate tubular member from said surface.

35 Preferably said fitting further includes clamping means for clamping said second end of said elongate tubular member to said hand-held power tool.

40 Preferably said fitting further comprises guiding means for coupling to said hand-held power tool and said shroud for guiding movement of said cutting means relative to said shroud in the manner such that said cutting means is maintained in a spaced relationship to said shroud.

45 Preferably said guiding means comprises at least two spacing elements, one of said elements connected about said shroud between said first and second ends, and the

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other of elements connected to said shroud adjacent said hand-held power tool, and at least one elongate element fixed to one of said spacing elements and passing through the other of said spacing elements whereby, in use, when
5 said hand-held power tool is moved in the direction of cutting said spacing elements move towards each other along said elongate element and maintain a fixed spatial relationship between said tube and said cutting means.

BRIEF DESCRIPTION OF THE DRAWINGS

10 An embodiment of the present invention will now be described by way of example only with reference to the accompanying drawings in which:

15 Figure 1 is a side view of a first embodiment of a debris extracting fitting connected to a hand held power drill;

Figure 2 is a view of the debris extraction fitting shown in Figure 1 when the hand-held power drill is in use;

20 Figure 3 is a side view of a second embodiment of the debris extraction fitting connected to a hand-held power drill prior to use of the drill;

Figure 4 is a side view of the debris extraction fitting shown in Figure 3 when the hand-held drill is in use; and,

25 Figure 5 is a plan view of a spacing element used in the debris extraction fitting shown in Figures 3 and 4.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

As shown in the accompanying drawings, with particular reference to Figures 1 and 2, there is provided
30 a debris extraction fitting 10 adapted for connection to a hand-held power tool, in this instance a rotary drill 12 having cutting means in the form of a drill bit 14. The fitting comprises a shroud 16 having a first end 18 for abutting a surface, such as brick wall 20 on which the
35 drill bit 14 will be applied, the shroud 16 surrounding at

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least a portion of the drill bit 14 adjacent the wall 20. Second end 22 of the shroud 16 is adapted for connection to the drill 12. The fitting 10 includes a conduit 24 in fluid communication with the shroud 16 and adapted for 5 fitting to a vacuum source (not shown). When in use, a vacuum source is connected to the conduit 24 and end 18 placed in abutment with the wall 20, so that as drill bit 14 cuts into the wall 20 any debris generated, such as chips of brick, plaster or mortar and dust is carried away 10 via the vacuum source. This prevents the debris from falling to the ground or becoming airborne.

Shroud 16 includes a compressible portion 26 which is able to compress in length by a distance equal to the length of cut, or more particularly, the depth of the 15 hole, required to be made by the drill bit 14. This ensures that the shroud 16 does not prevent the normal operation of the drill 12.

In its preferred form, the shroud 16 is in the form of an elongate tubular member 28 with the compressible 20 portion 26 being formed along the length of the member 28. Moreover, the compressible portion 26 is formed at end 18 so as to abut the wall 20 when the fitting 10 is in use. The compressible portion 26 can most conveniently be made from a length of rubber tubing which is shaped in a 25 concertina-like manner. By moulding the compressible portion 26 about a coil spring 30 the compressible portion is made resilient so as to return to a non-compressed state upon removal of the member 28 from the wall 20.

The member 28 also includes a substantially rigid 30 portion 32 which is substantially rigid in the direction of the length of the member 28, which also corresponds to the direction of cutting by the drill bit 14. Most conveniently, the portion 32 can be made from plastics materials.

Conduit 24 is in fluid communication with portion 35 32 and generally is made from the same material. Various tubes or adaptors 34, 36 can be coupled to the conduit 24

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and to each other in order to allow connection of conduit 24 to the vacuum source.

End 22 of the shroud 16 which corresponds to the end of rigid portion 32 opposite the compressible portion 26 is provided with a collar 38 of reduced diameter for receiving a boss 36 of the drill 12. A clamp (not shown) disposed about the collar 38 can be used for fastening the rigid portion 32 to the boss 36. Alternately, the collar 38 can be made in a manner or from a material which will 10 allow resilient expansion in the radial direction for self-biasing onto the boss 36. In a further alternate arrangement, the interior surface of collar 38 can be made with a taper so as to decrease in diameter in a direction toward end 18 to provide a self-tightening connection to 15 the boss 36.

The compressible portion 26 and rigid portion 32 are releasably connected together by way of a ring clamp 42. This allows for the interchanging of compressible portions 26 of different lengths.

20 The manner of use of the fitting 10 in relation to the drill 12 will now be described.

Drill bit 14 is initially locked into drill chuck 42. Collar 38 is then slipped over and connected to boss 36 and various adaptors 34, 35, where necessary, are used 25 to connect the conduit 24 to a vacuum source, such as a domestic vacuum cleaner. Drill bit 14 is then placed against the wall 20 at a location at which it is desired to drill a hole. If the drill bit 14 does not extend beyond end 18, the compressible portion 26 can be retracted by hand so as to allow a user to visually verify that the 30 drill bit 14 is placed at the correct location against wall 20. With end 18 abutting wall 20 and the vacuum source in operation, the drill 12 can now be operated to commence drilling. Any debris generated by the drill bit 14 cutting 35 into the wall 20 will be carried by the vacuum through compressible portion 26 and conduit 24 to the vacuum source. As the drill bit 14 progresses into the wall the

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compressible portion 26 continues to collapse to allow movement of the drilling bit 14 in the direction of drilling.

When drilling is finished and the drill bit 14 pulled out of wall 20 coil spring 30 acts to extend the compressible portion so as to return to its non-compressed state. In this way, end 18 maintains contact with the wall 20 to ensure that debris pulled out of the wall 20 by the drill bit 14 is also collected by the vacuum source. However, in order to ensure that end 18 maintains contact with wall 20 a user can physically grip compressible portion 26 to hold it against wall 20.

A second embodiment of the invention will now be described with reference to Figures 3 - 5 in which the same reference numbers are used to indicate like features.

This embodiment is identical to the first embodiment shown in Figures 1 and 2 with the addition of a guide 44 which is coupled to the drill 12 and the shroud 16 for guiding movement of the drill bit 14 relative to the shroud 16 in order to maintain a spaced relationship between the drill bit 14 and the shroud 16. The guide 44 comprises three spacing elements 46, 48 and 50. Spacing element 46 fits over boss 36 of the drill 12. While spacing elements 48 and 50 fit over compressible portion 26 of the shroud.

As seen most clearly in Figure 4, each spacer is in the form of a planar ring 52 having a central opening 54 and three flanges 56 evenly spaced about the outer periphery of the planar ring 52. Each flange 56 is provided with a hole 58.

The spacing elements 46, 48 and 50 are disposed along the length of tubular member 28 and oriented so that the holes 58 of adjacent spacing elements are in linear alignment. Spacing elements 50 and 48 frictionally engage the compressible portion 26. An elongate element in the form of a rod 60 passes through each set of aligned holes 58. End 62 of each rod distant the drill 12 is fastened by

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nuts 63 to the most distant spacing element 50. Each rod 60 passes freely through holes 58 in the spacing elements 48 and 50 with their opposite ends 64 extending beyond spacing element 46. If desired, a circlip (not shown) or 5 other stopping mechanism can be disposed about end 64 of each rod to ensure it does not move out of holes 58 in the spacing element 46.

Elongate coil springs 66 surround the portions of rods 60 between spacing elements 50 and 48.

10 The guide 44 is of a length less than that of shroud 16 so that part of the compressible portion 26 extends beyond spacing element 50. The guide 44 is particularly useful when the fitting 10 is used on a drill 12 which is required to drill a relatively deep hole and 15 therefore has connected to it a relatively long drill bit 14. The guide 44 operates to maintain the spatial relationship between the drill bit 14 and the interior of compressible portion 26 so that the compressible portion does not move to an extent such that it contacts the drill 20 bit 14.

The method of operation of the fitting 10 shown in Figures 2 and 3 will now be described.

25 The shroud 16 operates in exactly the same manner in this embodiment as it does in the first embodiment described above. After the tip of drill bit 14 is placed at the desired location on wall 20 with end 18 of the shroud contacting the wall 20 and the vacuum source actuated drill 12 is operated to commence drilling a hole. Debris generated by the drill bit 14 cutting into the wall 30 20 is collected in the same manner as described above. The guide 44 maintains a spaced relationship between the compressible portion 26 and the drill bit 14 to ensure that they do not come into contact while the drill 14 is in operation. As the drill bit 14 progresses into wall 20 35 compressible portion 26 continues to collapse with end 18 maintaining contact with the wall 20. Eventually, the length of compressible portion 26 from end 18 to spacing

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element 50 can compress no further. In order to allow the drill bit 14 to progress further into the wall 20 the rods 60 slide through holes 58 in the spacing elements 48 and 46 as the drill 12 is pushed further toward the wall 20. When 5 the hole being cut into wall 20 has reached a desired depth the drill 12 is pulled away from wall 20 with the drill bit 14 being retracted from the drilled hole. As this occurs, spring 30 acts to expand the compressible portion 26 and maintain contact of end 18 against the wall 20. 10 Additionally, springs 66 also extend so as to force spacing elements 50, 48 and 46 away from each other. When there is frictional contact between spacers 50 and 48 and the compressible portion 26, the action of springs 66 also assists in maintaining end 18 in contact with wall 20 as 15 the drill bit 14 is being retracted. Meanwhile, debris being pulled out of the hole by drill bit continues to be collected by the vacuum source.

In an alternate method of removing the drill bit 14 from the wall, it may be possible by gripping the conduit 24 with one hand and the drill 12 with the other, to pull the drill away from the wall and out of shroud 16 while maintaining end 18 of the shroud 16 in contact with the wall 20.

Now that embodiments of the invention have been described in detail it will be apparent to those skilled in the relevant arts that numerous modifications and variations may be made without departing from the basic inventive concepts. For example, the use of the fitting 10 has been described in relation to a power drill 12. 25 However, the basic inventive concepts can be applied to fittings for use with other hand-held power tools. In addition, the compressible portion 26 can be disposed at end 22 of the shroud with the substantially rigid portion adjacent end 18. Moreover, the entire length of the 30 elongate tubular member 28 can be made compressible. All such variations and modifications are deemed to be within 35 the scope of the present invention the nature of which is

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to be determined from the foregoing description and the appended claims.

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THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A debris extraction fitting adapted for connection to a hand-held power tool having a cutting means, said fitting comprising:

5 a shroud for abutting a work surface on which said cutting means is applied, said shroud surrounding at least a portion of said cutting means adjacent said surface; and,

10 a conduit in fluid communication with said shroud, said conduit having a distant end adapted for connection to a vacuum source, whereby, in use, when a vacuum source is connected to said conduit and said cutting means applied against said surface, debris created by said cutting means is carried from said surface through said shroud and said conduit to said vacuum source.

15 2. A debris extraction fitting according to claim 2, wherein said shroud includes a compressible portion which can compress in the direction of cutting by said cutting means, whereby, in use, said compressible portion can compress by a distance equal to the length of the cut required to be made by said cutting means.

20 3. A debris extraction fitting according to claim 2, wherein said shroud comprises an elongate tubular member and said compressible portion is formed along a length of said elongate tubular member, said elongate tubular member surrounding at least a portion of said cutting means adjacent said surface and having a first end adapted for abutting said surface.

25 4. A debris extraction fitting according to claim 3, wherein a second end of said elongate tubular member is adapted for connection to said hand-held power tool.

30 5. A debris extraction fitting according to claim 4,

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wherein said elongate tubular member includes a substantially rigid portion, being substantially rigid in the direction of the length of said elongate tubular member, and wherein, said conduit is connected to said 5 substantially rigid portion.

6. A debris extraction fitting according to claim 5, wherein said substantially rigid portion is disposed adjacent one of said first and second ends of said elongate tubular member.
- 10 7. A debris extraction fitting according to claim 6, wherein said substantially rigid portion is disposed at said second end of said elongate tubular member and said compressible portion is disposed at said first end of said elongate tubular member.
- 15 8. A debris extraction fitting according to claim 7, wherein said compressible portion and said substantially rigid portion are detachably coupled together.
9. A debris extraction fitting according to claim 8, 20 wherein said compressible portion is resiliently compressible so as to return to a non-compressed state upon removal of said elongate tubular member from said surface.
10. A debris extraction fitting according to claim 9, further comprising guiding means for coupling to said hand-held power tool and said shroud for guiding movement of 25 said cutting means relative to said shroud in the manner such that said cutting means is maintained in a spaced relationship to said shroud.
11. A debris extraction fitting according to claim 10, wherein said guiding means comprises at least two 30 spacing elements, one of said elements connected about said shroud between said first and second ends, and the other of

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elements connected to said shroud adjacent said hand-held power tool, and at least one elongate element fixed to one of said spacing elements and passing through the other of said spacing elements whereby, in use, when said hand-held
5 power tool is moved in the direction of cutting said spacing elements move towards each other along said elongate element and maintain a fixed spatial relationship between said tube and said cutting means.

12. A debris extraction fitting according to claim 5,
10 wherein said compressible portion and said substantially rigid portion are detachably connected together.

13. A debris extraction fitting according to claim 4,
further comprising clamping means for clamping said second
end of said elongate tubular member to said hand-held power
15 tool.

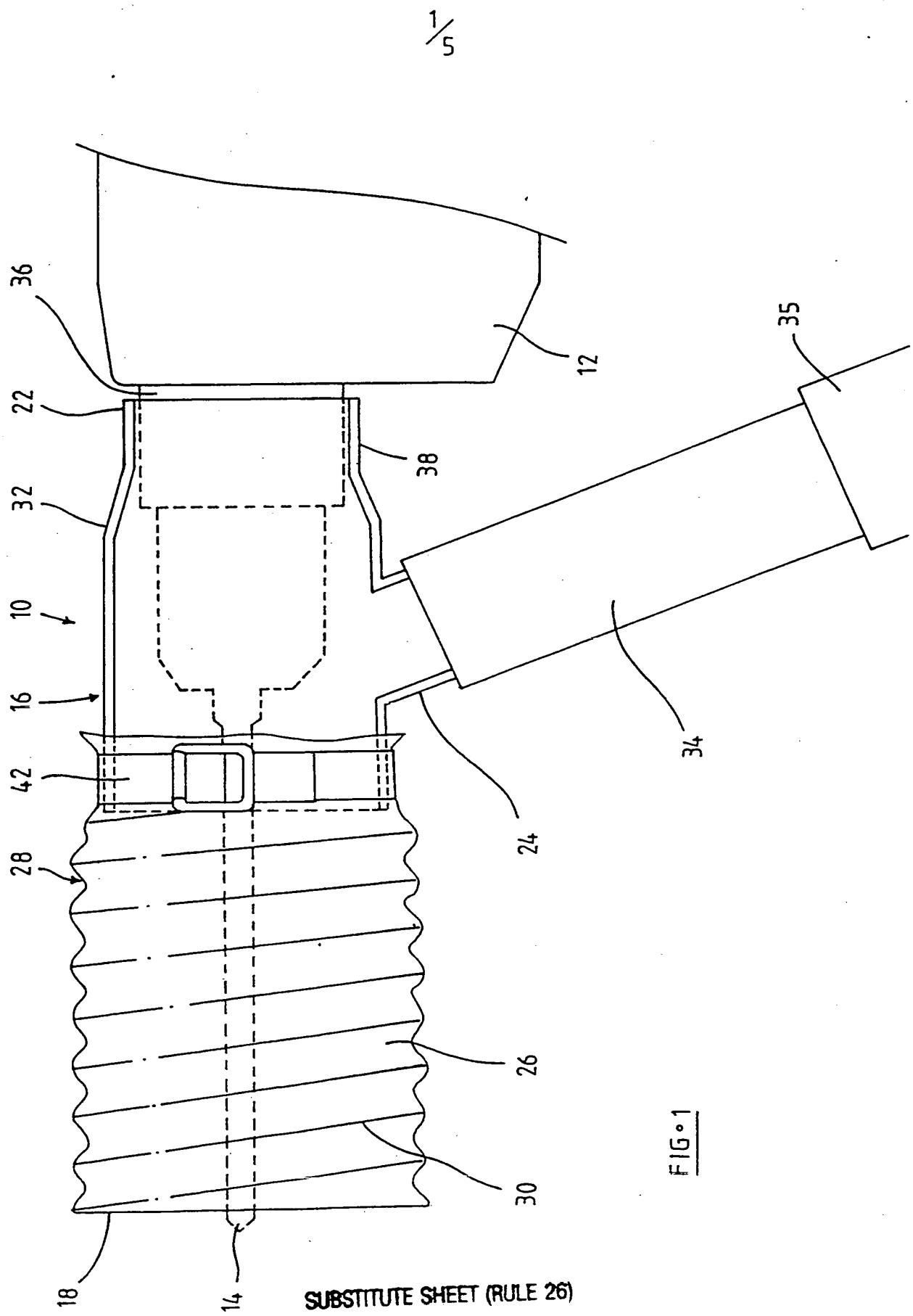
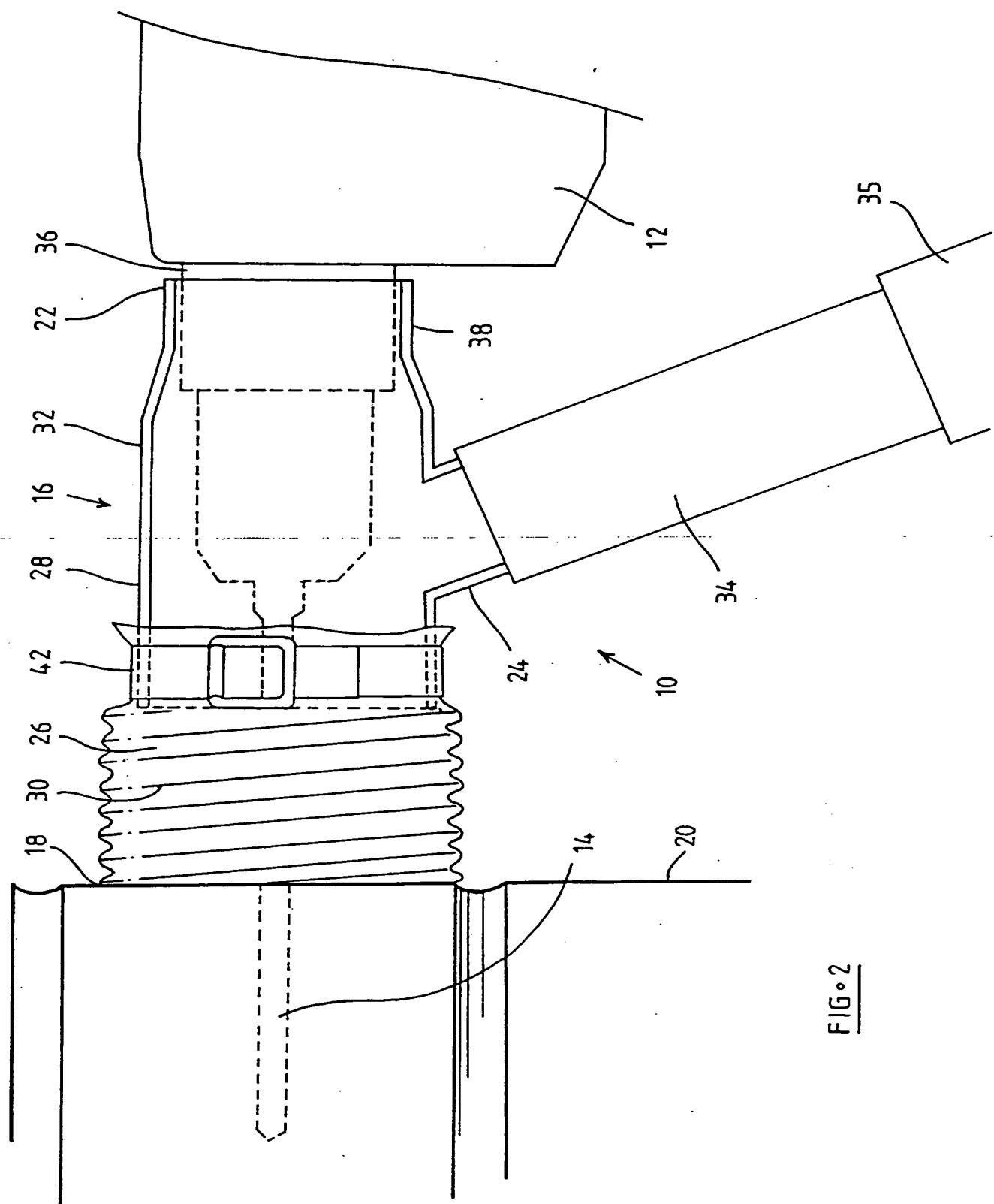


FIG. 1

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5FIG. 2

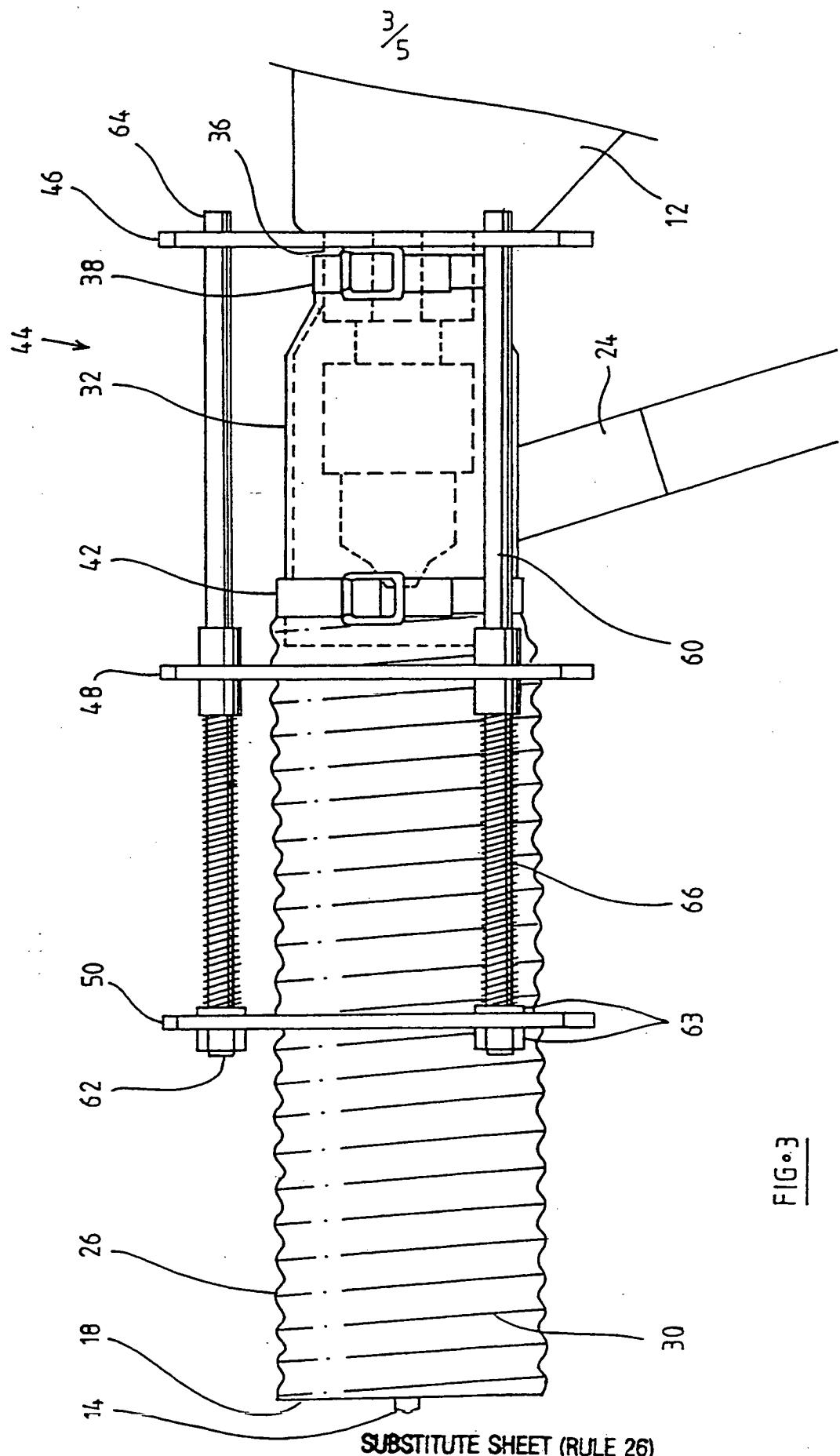
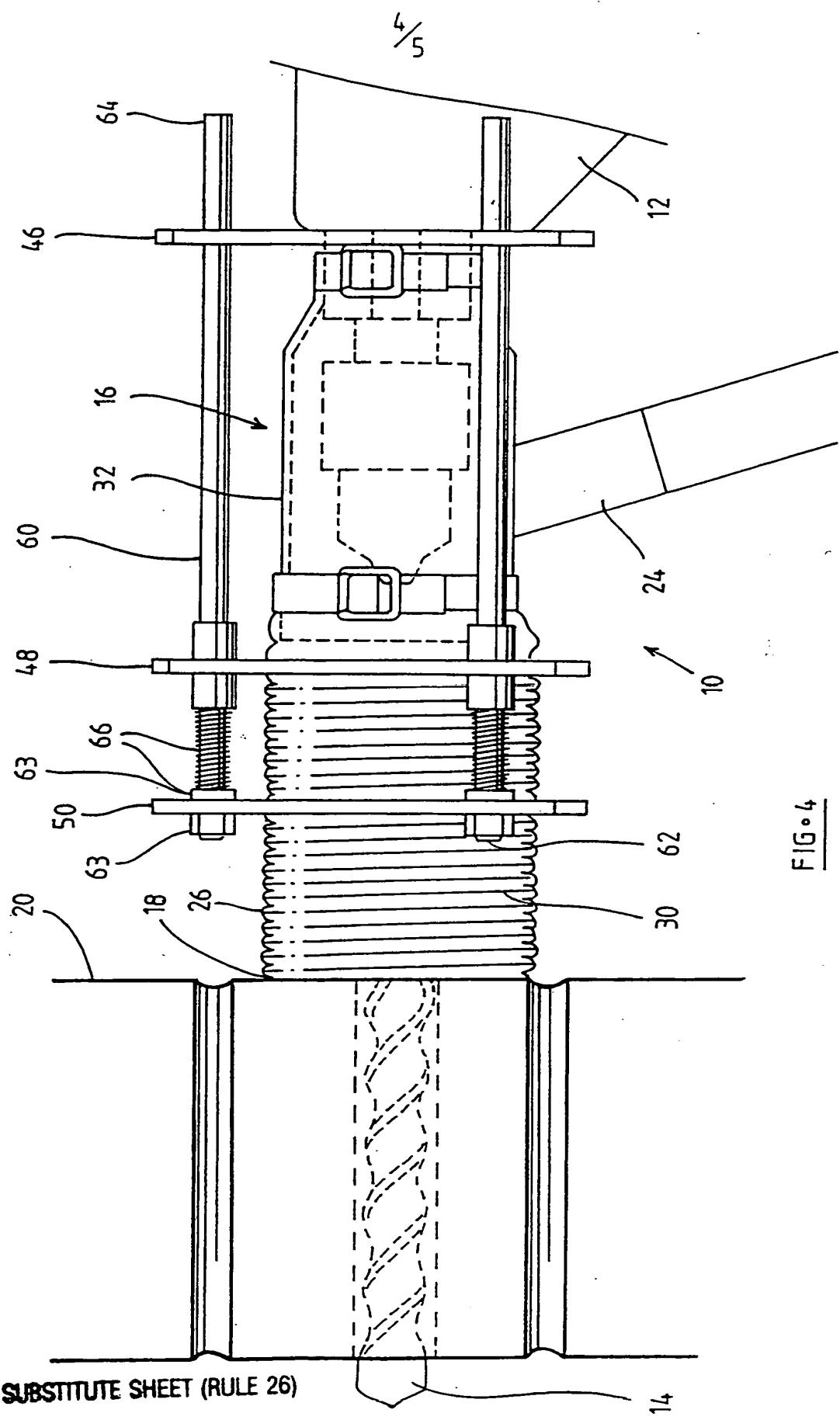


FIG. 3



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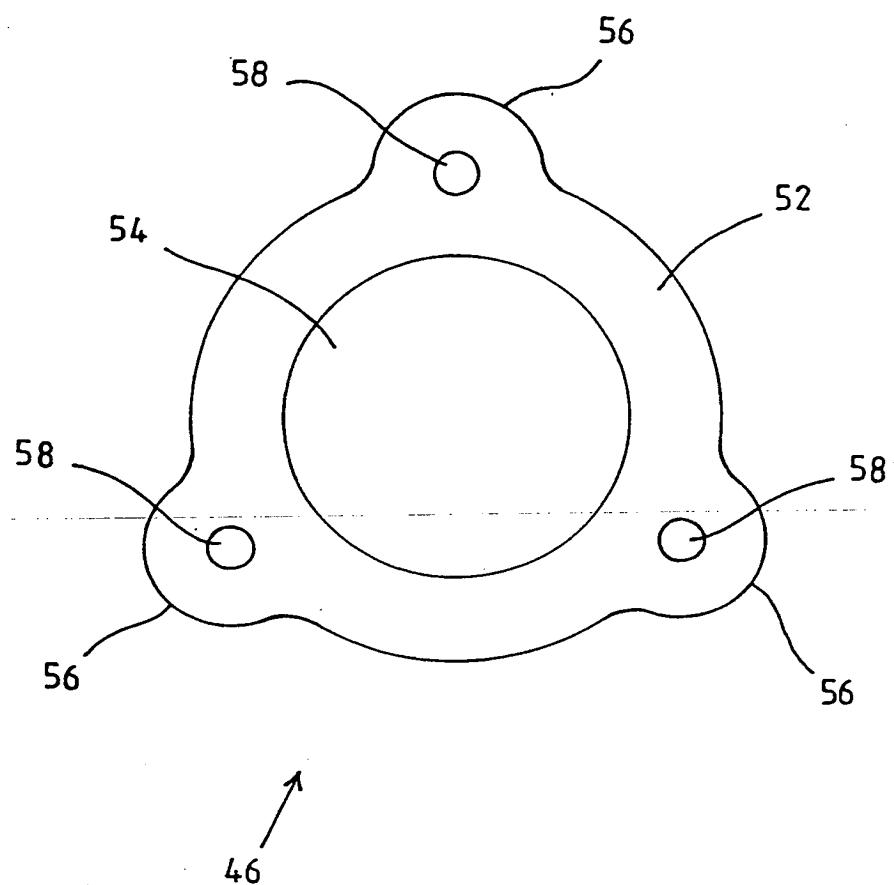


FIG. 5

INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER
Int. Cl.⁶ B08B 15/04, B27C 3/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC B08B 15/04, 15/02, B27C 3/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
AU: IPC as above

Electronic data base consulted during the international search (name of data base, and where practicable, search terms used)
DERWENT:

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.
X	GB, A, 2130715 (DESOUTTER LIMITED) 6 June 1984 (6/06/84) See whole document	1-7, 13
X	US, A, 3850254 (HIRDES) 26 November 1974 (26/11/74) See whole document	1-9, 12-13
X	DE, A, 3341818 (FISCHER A) 30 May 1985 (30/05/85) See whole document	1
X	DT, A, 2427450 (CLARKSON INDUSTRIES INC) 2 January 1975 (2/01/75) See whole document	1-7, 13

Further documents are listed
in the continuation of Box C.

See patent family annex.

* Special categories of cited documents :	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle of theory underlying the invention
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Date of the actual completion of the international search
9 May 1995

Date of mailing of the international search report

18 May 1995 (18. 05. 95)

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INTERNATIONAL SEARCH REPORT

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report				Patent Family Member	
US	3850254	DE	2233125	FR	2191163
		GB	1431353		
DE	2427450	AU	68904/74	CA	1014747
		GB	1468898	JP	50022390
		US	3882644		
END OF ANNEX					